

STAT100 Problem Set 6

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Section 0122

1a.

Probability of a random student having 3.15 GPA or below, mean = 3.03 and stdev = 0.52

$$Z = (X - \text{mean}) / \text{stdev}$$

$$Z = (3.15 - 3.03) / 0.52$$

$$Z = 0.12 / 0.52 = 0.2307 = 0.23$$

Probability of a random student having 3.15 GPA or below is 0.5910

1b.

Using rstudio, we get

```
> # Erik Ter-Gabrielyan  
> pnorm(3.15, mean=3.03, sd=0.52)  
[1] 0.591253  
>
```

Rounded to 0.5913

2.

Probability of a random male student having 3.15 GPA or below, mean = 2.94 stdev = 0.54

$$Z = (X - \text{mean}) / \text{stdev}$$

$$Z = (3.15 - 2.94) / 0.54$$

$$Z = 0.21 / 0.54 = 0.38888888 = 0.39$$

Probability of random male student having 3.15 GPA or below is 0.6517

3.

Probability of a random female student having 3.15 GPA or below, mean = 3.12 stdev = 0.51

Using rstudio, we get

```
> # Erik Ter-Gabrielyan  
> pnorm(3.15, mean=3.12, sd=0.51)  
[1] 0.5234537  
>
```

Rounded to 0.5235

4a.

Probability of a random student having 2.50 GPA or above, mean = 3.03 stdev = 0.52

First finding 2.50 or below

$$Z = (X - \text{mean}) / \text{stdev}$$

$$Z = (2.50 - 3.03) / 0.52$$

$$Z = -1.0192 = -1.02$$

Probability of student having 2.50 GPA or below = 0.1539

To find probability of student having 2.50 GPA or above, subtract it from 1

So, probability of student having 2.50 GPA or above =  $1 - 0.1539 = 0.8461$

4b.

Using rstudio, we get

```
> # Erik Ter-Gabrielyan  
> pnorm(2.50, mean=3.03, sd=0.52, lower.tail=FALSE)  
[1] 0.8459533  
>
```

Rounded to 0.8460

5.

Probability of random student having between 2.25 and 3.75 GPA, mean = 3.03 stdev = 0.52

To find this, we simply find 2.25 or below and 3.75 or above and subtract both from 1

First finding 2.25 GPA or below

$$Z = (2.25 - 3.03) / 0.52$$

$$Z = -1.5$$

Probability of a random student having a 2.25 GPA or below = 0.0668

Next we find probability of a student having 3.75 GPA or above

$$Z = (3.75 - 3.03) / 0.52$$

$$Z = 1.3846 = 1.38$$

$$P = 0.9162$$

$$1 - 0.9162 = 0.0838$$

Probability of a random student having 3.75 GPA or above = 0.0838

Subtracting both 2.25 GPA or less and 3.75 GPA or above

$$1 - 0.0668 - 0.0838 = 0.8494$$

So, probability of random student having between 2.25 and 3.75 GPA is 0.8494

6.

Probability of a female student having between 3.25 and 4 GPA, mean = 3.12 stdev = 0.51

To find this, we simply find 3.25 GPA or below and 4 GPA or above and subtract both from 1  
(Could also subtract 3.25 or below probability from 4 or below probability)

Using rstudio we find

```

> # Erik Ter-Gabrielyan
> pnorm(3.25, mean=3.12, sd=0.51)
[1] 0.6006006
> pnorm(4, mean=3.12, sd=0.51)
[1] 0.9577804
> pnorm(4, mean=3.12, sd=0.51, lower.tail=FALSE)
[1] 0.04221958
> 1 - 0.6006006 - 0.04221958
[1] 0.3571798
> |

```

7a.

If male student has 3.8 GPA, what percentile is his GPA with mean = 2.94 stdev = 0.54  
First calculating Z score

$$Z = (3.80 - 2.94) / 0.54$$

$$Z = 1.5926 = 1.59$$

$$P(3.8 \text{ GPA or less}) = 0.9441$$

So, the male student's score of 3.8 GPA is the 94th percentile.

7b.

Using rstudio for the same problem, we find the same.

```

> # Erik Ter-Gabrielyan
> round(100*(pnorm(3.80, mean=2.94, sd=0.54, lower.tail=TRUE)), 0)
[1] 94

```

8.

Find GPA that would be in the 67th percentile for all students with mean = 3.03 stdev = 0.52

Using rstudio, we find

```

> # Erik Ter-Gabrielyan
> round(qnorm(0.67, mean=3.03, sd=0.52, lower.tail=TRUE), 0)
[1] 3

```

A GPA of 3.00 would be in the 67th percentile for all students.

9.

Which is more likely, female student with 3.75 GPA or above, or male student with 3.6 GPA or above

First calculating female student 3.75 GPA or above with mean = 3.12 stdev = 0.51

$$Z = (3.75 - 3.12) / 0.51$$

$$Z = 1.2352 = 1.24$$

$$P(3.75 \text{ or below}) = 0.8925$$

$$P(3.75 \text{ or above}) = 1 - 0.8925 = 0.1075$$

Next calculating male student 3.6 GPA or above with mean = 2.94 stdev = 0.54

$$Z = (3.6 - 2.94) / 0.54$$

$$Z = 1.2222 = 1.22$$

$$P(3.6 \text{ or below}) = 0.8888$$

$$P(3.6 \text{ or above}) = 0.1112$$

Since the probability of a male student having 3.6 GPA or above is 0.1112 and the probability of a female student having 3.75 GPA or above is 0.1075, it is more likely that a male student will have a 3.6 GPA or above.